SUPPLEMENTAL MATERIAL FOR THE COUNCIL'S ECOSYSTEM COMMITTEE

Issues Relevant to Area-specific Management for the Aleutian Islands

This discussion addresses the following issues:

- What is the purpose of the Aleutian Islands action?
- What is a Fishery Ecosystem Plan?
- What is a Special Management Area?
- What is the difference between the options (Fishery Ecosystem Plan, Special Management Area, AI Fishery Management Plan)?
- What could the Council's next steps be?

There are also three appendices to this document that look at a) what is an ecosystem approach to fisheries, and what are the ways in which the Council might move forward with it; b) an excerpt from the Ecosystems Principles Advisory Panel report to congress on Fishery Ecosystem Plans; c) how does an Ecosystem Approach to Fisheries fit with an Ecosystem Approach to Management?

1. What is the purpose of the Aleutian Islands action?

In February 2005, the Council referred the Aleutian Islands discussion paper to the Ecosystem Committee for review and recommendations. One area in which the Ecosystem Committee might assist the Council is in the elaboration of a problem statement for the Aleutian Islands action. The SSC, in their minutes from December 2005, encouraged the Council to develop a statement of goals and objectives for the proposed action. The motivation for selecting the Aleutian Islands as a candidate for special management is discussed in the paper, but a clear statement of what area-specific management is intended to achieve has not yet been developed.

In considering this question, staff has come up with two possible ways to conceive of what the Council may be trying to achieve. Although the two characterizations are closely related, they frame somewhat different problem statements. Is the purpose of the Aleutian Islands action to provide an opportunity for the Council to move forward with an ecosystem approach to fisheries in the North Pacific, or is the purpose of the action to address an issue in the Aleutian Islands?

In the first instance, the Council is faced with a growing national momentum to adopt an ecosystem approach to fisheries (EAF). Appendix A describes an ecosystem approach to fisheries, and the ways it may be incorporated into fishery management. While many of the Council's management actions can arguably be considered to reflect an overall ecosystem approach, there is still progress to be made. There are many ways in which the Council could apply an ecosystem approach in its fishery management; however, much attention has been given to the concept of Fishery Ecosystem Plans (FEPs), or similar ecosystem-based fishery management documents. The Ecosystems Principles Advisory Panel touted FEPs as the way to move forward with ecosystem-based fishery management (EPAP 1999). Various draft legislative documents that have passed through Congress have suggested revisions to the Magnuson-Stevens Act that would require either FEPs or some other type of fishery ecosystem management document. To date, however, there are few examples of such documents, and there is no national template for their implementation, or their relationship to fishery management plans (FMPs).

The Council may believe that applying a more explicit ecosystem approach to fisheries is the appropriate way to move forward in fishery management. With regard to fishery ecosystem planning, the Council has the opportunity to help define the standard for implementing an EAF. As the practicalities of developing a fishery ecosystem planning document have yet to be worked out, the Council may feel it is appropriate to designate an ecosystem area as a test case.

In recent years, the Aleutian Islands have been at the forefront of many issues before the Council. The Aleutian Islands area has figured in focused measures to protect Steller sea lions and seabirds, conservation of benthic habitats that support coral and other special resources of public interest, and allocation issues related to the Aleutian Islands pollock and Pacific cod fisheries. Recent scientific evidence indicates a clear ecological difference between the eastern Bering Sea shelf ecosystem and the western Aleutian Islands archipelago. For these reasons, the Aleutian Islands ecosystem area may merit consideration as a candidate for area-specific management, and could be an appropriate test case for the Council to develop a fishery ecosystem planning document.

However, the Council's purpose in discussing area-specific management in the Aleutian Islands may instead be to recognize and address the uniqueness of the Aleutian Islands area. By its actions to date, the Council recognizes that the Aleutian Islands contain unique ecological values that the Council wishes to preserve. Far less is understood about the ecological interactions in this area than in the eastern Bering Sea, yet the two areas are managed conjointly in all of the Federal fishery management plans. The Council may wish to consider fishery interactions within this ecosystem more directly, and applying an ecosystem approach to fisheries may promote this goal. To that end, the Council may explore the merits of an area-specific management approach in the Aleutian Islands.

The differences in intent may be subtle, but they create a different context for approaching the Aleutian Islands action. One purpose is the desire to move forward with applying ecosystem-based fishery management principles; the other is a focused concern over the Aleutian Islands area because of its ecological uniqueness and recurrent issues cropping up in that region. The Council's answer to these two intents, though, is essentially the same – to pursue an ecosystem-based management approach in the Aleutian Islands that recognizes the area's distinct ecological relationships.

The Council might phrase two problem statements, or statements of goals and objectives as per the SSC's recommendation, for the action deriving from these two different approaches. Both would engender the same range of alternatives; however, the Council sends a different message about the overall purpose of its action depending on the approach.

In brief, the two statements might be expressed:

1. The Council recognizes that an explicit Ecosystem Approach to Fisheries (EAF) is a desirable process for future management of the marine fishery resources in the Alaskan EEZ and therefore is a concept that it wishes to pursue and eventually implement. A primary component of an EAF is the development of ecosystem-based fishery planning documents, and the Council intends to move forward with such development on a pilot basis. The Council recognizes that the Aleutian Islands ecosystem is a unique environment that supports diverse and abundant marine life, and a human presence that is closely tied to the environment and its resources. In light of these features, the Aleutian Islands ecosystem provides an appropriate area to develop such an approach.

2. The Council recognizes that the Aleutian Islands ecosystem is a unique environment that supports diverse and abundant marine life and a human presence that is closely tied to this environment and its resources. The Council believes that in light of these features a better framework might be employed to guide future fishery management decisions in the Aleutian Islands area. Adopting an

ecosystem approach to fisheries in the Aleutian Islands could allow the Council to better focus on the unique features of and interactions within the ecosystem area.

Either of these statements would start the Council on a path toward implementing some kind of ecosystem-based fishery management in the Aleutians. That management process would likely have at least two guiding principles: one, deliberate and intentional consideration of ecosystem variables that Council-managed fisheries affect (how fisheries affect the ecosystem), and two, conscious consideration of ongoing ecological processes that affect fish stocks and fisheries (how the ecosystem affects fisheries).

2. What is a Fishery Ecosystem Plan?

The Fishery Ecosystem Plan was described in detail in the Ecosystems Principles Advisory Panel (EPAP)'s Report to Congress in 1999. Appendix B contains excerpted material from that report, describing the principles, goals, and policies of ecosystem-based fishery management, and the steps to develop a FEP. In brief, the FEP is intended to provide the mechanism to integrate the ecosystem goals, principles, and policies into single species or species complex FMPs.

A FEP describes the interactions of the ecosystem, and the degree to which they are considered in conservation and management measures, including the efforts being made to monitor the effects of fishing. In order to address the goal of maintaining ecosystem health and sustainability, the FEP should develop indices of ecosystem health as targets for management.

The FEP is intended to:

- "provide Council members with a clear description and understanding of the fundamental physical, biological, and human/institutional context of ecosystems within which fisheries are managed;
- direct how that information should be used in the context of FMPs; and
- set policies by which management options would be developed and implemented," (EPAP 1999).

Regulatory authority, and interaction with FMPs

FEPs are to be developed for each ecosystem area, and a FEP would likely apply to more than one FMP. In the North Pacific, for example, an Aleutian Islands FEP would apply to the Federal groundfish (BSAI and perhaps GOA, depending on the boundary of the Aleutian Islands ecosystem), king and tanner crab, scallop, and salmon FMPs. There is no explicit discussion in the EPAP report as to the interaction of the FEP with state water fisheries; however, it would be desirable for the Council to coordinate with the State when developing the FEP.

In terms of regulatory authority, the EPAP report generally recommends that specific management measures be included in the FMPs, and that the FEP provide an ecosystem policy and understanding from which management measures could be developed for the individual FMPs as necessary. Yet the report does suggest that those regulations or management measures which extend across individual FMPs be contained in the FEP. The example used is essential fish habitat protection measures, which may apply to all fisheries, and thus including them in the FEP would reduce redundancy.

The intent of the report was for FEPs to eventually become required by law, and to meld with FMPs in the long term. At present, however, there is no authority attached to a FEP, and only the FMP can authorize regulations to implement management measures. Therefore it would not be possible, without a change in statute, for a FEP to authorize regulations. Management measures must be incorporated at the FMP level, not the FEP level.

This means that the influence of the FEP would be to extend an ecosystem policy over the FMPs in the ecosystem area, but not to prescribe management measures. This policy would guide the development of management measures in each FMP. The FEP would also contain an assessment of how to determine whether the goals and objectives of the ecosystem policy are being met.

Examples of Fishery Ecosystem Plans

There are very few examples nationally of Fishery Ecosystem Plans, and they do not provide a clear template of how to do FEPs. The Chesapeake Bay FEP embraces many of the concepts of the Ecosystems Principles Advisory Panel, including developing a strategic plan that accounts for the role of habitat and predator-prey relationships, social and economic considerations, and unpredictable externalities such as climate impacts. The FEP does not specify what measures management agencies should undertake, but instead lays out what is known about the ecosystem, and the kind of research and monitoring needed by fishery managers. It also includes the impacts of non-fishery activities on, for example, fish habitat. The South Atlantic Council has taken a similar approach in developing their FEP, which extends their existing Habitat Plan to include the elements recommended by the EPAP.

The Western Pacific Council adopted a different concept of a Fishery Ecosystem Plan, by melding it with their FMP for the coral reef ecosystems. The FMP incorporates many of the principles and policies recommended by the EPAP.

Revised Groundfish FMPs?

The Council's revised BSAI and GOA groundfish FMPs contain many elements of a FEP. The revised management policy, adopted by the Council following the PSEIS analysis, is a broad, ecosystem-based policy. It contains goals and objectives for each of the ecosystem components, and a management approach statement that provides a means to balance ecological, social, and economic objectives. Many of the recommendations of the EPAP are incorporated in the groundfish management program, such as buffers against uncertainty, indices for ecosystem health, long-term monitoring data, and the habitat needs of many of the ecosystem's fish species.

One difference between the groundfish FMPs and a FEP as intended by the EPAP is that it applies only to a single species complex in each management/ecosystem area, rather than all fisheries in that area. Also, much of the ecosystem information that is used in managing the groundfish fisheries is not contained in the FMP, but rather is available to managers in supplemental documents such as the SAFE reports, including the annual Ecosystem Considerations appendix. The knowledge base for such information is constantly expanding, and including it in the FMP could be restrictive due to the requirements of the formal process for amending the FMP.

FEP for the Aleutian Islands

Conceptually, a Fishery Ecosystem Plan for the Aleutian Islands would be a blueprint for guiding the management of all fisheries in the geographic region. The information in the FEP would provide information on other components of the ecosystem that Council-managed fisheries may affect and how they may affect Council-managed fisheries, and would allow the Council to deliberately consider such interactions in determining management measures for the Aleutian Islands. A FEP might be considered to be an umbrella process for guiding fishery management decisions in a specific geographic region; however, the decision making would be conducted at the FMP level for each distinct and separate fish or shellfish assemblage. The decision making process would include a focused consideration of the role of

each ecological component of the region (seabirds, marine mammals, communities, industries…) in the sustainability of the whole.

Possible issues that might be addressed under a FEP are briefly listed below.

- For management decisions that result in harvest of non-target species, to what extent are these non-target species important as prey for other fish, seabirds, or marine mammals?
- For management decisions that might result in incidental take of seabirds or marine mammals, what is the current population status of these seabirds and marine mammals? Are the trends up or down? Would the possible incidental take of seabirds or marine mammals, or removals of their prey items, have any measurable effect on their populations?
- For management decisions that result in harvest of target species, what are the population dynamics of those target species and to what extent would harvest change those dynamics? What other species of fish, seabirds, or marine mammals rely on these target species? How might current harvests affect future geographic distribution of target species, spawning locations and success, juvenile production, and recruitment (to both a fishery and to the reproductive segment of the population)? How might fisheries affect the behavior of predators that rely on this target species biomass?
- The Council might consider ecosystem response to biomass (energy) removals by fishing, in time and space, as well as ecosystem response to biomass (nutrient) inputs from offal and discards at sea and point source nutrient input along the Coast (processor waste). In part, this is a redistribution of energy in the ecosystem – how is this affecting the marine system?
- The Council might consider the phenology of both target species and non-target species and how harvest might alter the timing of key events in the life cycle of these species. For example, could spawning be shifted in time because of harvest removals of spawning fish during a particular time period?
- The Council would consider uncertainty in the scientific knowledge of natural mortality for target fish and non-target species, and develop management policies to address uncertainty.
- What process might the Council employ to adaptively learn about ecosystem impacts of fishery management decisions and employ this new knowledge in future decision making? How might the Council adapt management measures to compensate for environmental change or regime shifts?

3. What is a Special Management Area?

The term ‘special management area’ does not have any specific legal or statutory meaning for the Alaska Region, and no ‘special management areas’ have been designated in the EEZ by other Councils, based on a web search.

In the preliminary discussion paper, the concept of designating the Aleutian Islands as a Special Management Area within the BSAI groundfish FMP was addressed. Lacking direction from the Council as to their intent, the Special Management Area was described as a designation within the groundfish FMP, to apply to the Aleutian Islands subarea. The intent of the designation would be to allow the Council to recognize the role of commercial fishing within ecosystem interactions, and the need to balance the impacts of fishing with other ecosystem relationships. In order to monitor and assess the Special Management Area, it was suggested that a cross-agency scientific ‘team’ be created, under the oversight of the SSC and the Council, that would prepare a baseline assessment of the Aleutian Islands, and provide advice on fishery management actions that affect the Aleutian Islands. The team would function similarly to a Plan Team, and would be comprised of scientists from NMFS, USFWS, the State

of Alaska, academia, and other appropriate stakeholders. The baseline resource assessment of the Aleutian Islands would contain much of the same information as a Fishery Ecosystem Plan for the area, in terms of describing the ecosystem interactions and identifying metrics by which to monitor the health of the ecosystem. However, as the designation would only be in the groundfish FMP, the assessment would not influence the management of other fisheries in the area.

Another interpretation would also designate the AI subarea as a Special Management Area within the groundfish FMP. Ecosystem information, such as would be included in the baseline assessment discussed above, would be included directly in the FMP, and this would be the extent of the action. The Council could, of course, at any time choose to develop specific management measures for the Aleutian Islands. A disadvantage of including such information directly in the FMP is that it is constantly changing, as new information emerges to advance our understanding of the ecosystem. It would be very difficult to keep the FMP up to date with the current state of the ecosystem.

4. What is the difference between the options (FEP, SMA, FMP)?

The preliminary discussion paper introduces three possible options for facilitating the implementation of an ecosystem approach to fisheries vis-à-vis the Aleutian Islands. These are 1) developing a new and separate groundfish Fishery Management Plan for the Aleutians that contains EAF elements, 2) establishing the Aleutian Islands subarea as a Special Management Area within the existing BSAI groundfish FMP, or 3) preparing and implementing a Fishery Ecosystem Plan for the Aleutian Islands. The three options are illustrated in Figure 1.

Developing a separate FMP for the Aleutian Islands is a process with which the Council is familiar. This would require a multi-year process of extracting, from the current BSAI groundfish FMP, the Aleutian Islands measures and collecting these into a separate FMP As evidenced in Table 1, many of the management measures in place in the BSAI groundfish fisheries are already specific to the Aleutian Islands.

Designating a Special Management Area might be accomplished more readily, as it would involve only amending the BSAI groundfish FMP rather than developing a new one. This would require an assessment of the Aleutian Islands subarea, and potentially development of goals for the Aleutian Islands region.

Preparing a Fishery Ecosystem Plan (FEP) would be a comprehensive process of collecting information about the Aleutian Islands ecological interactions, determining indices for monitoring ecosystem health and sustainability, and assessing fishery and non-fishery impacts on the sustainability of fisheries in the ecosystem.

5. What are the Council's next steps?

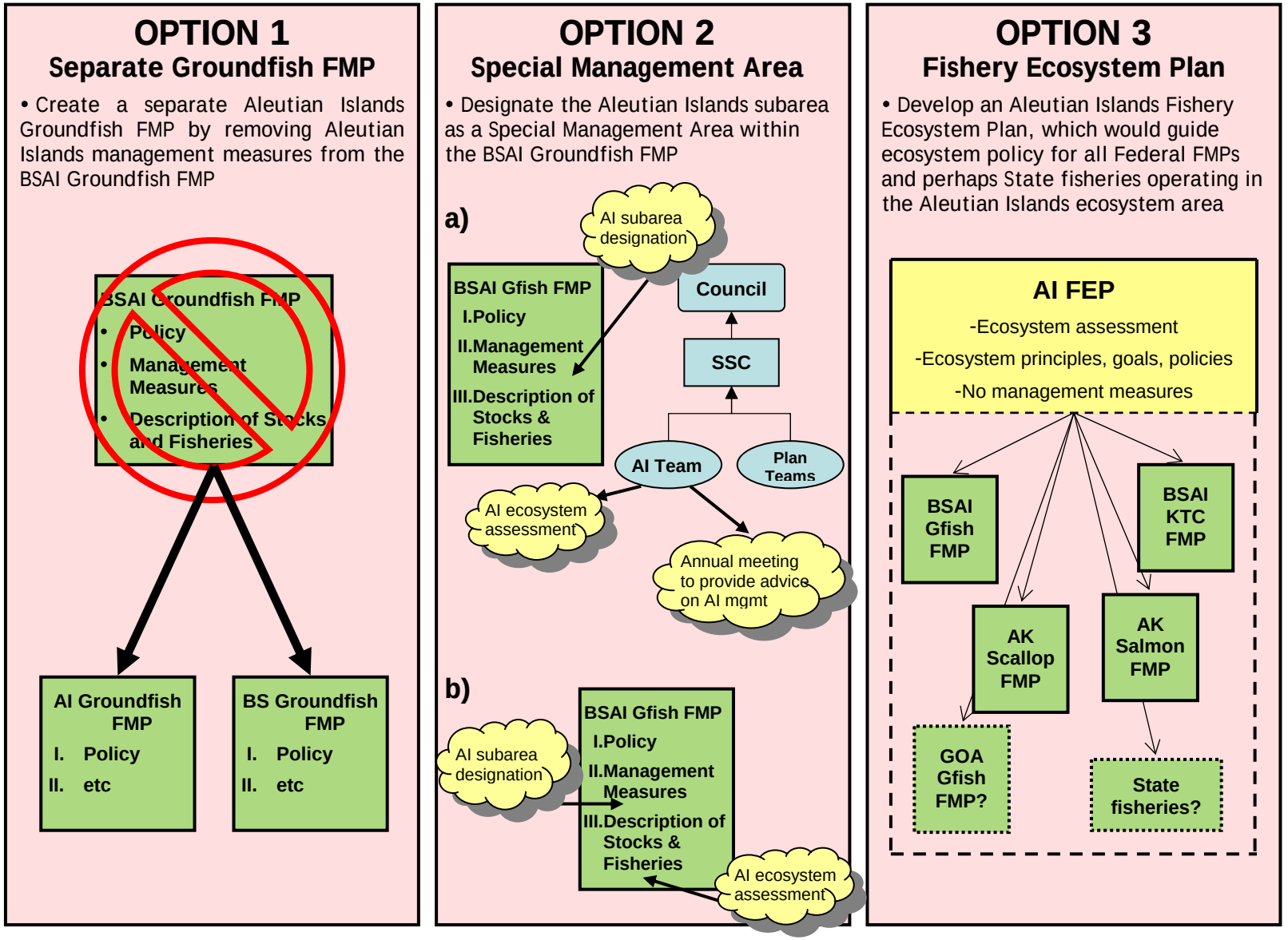
All three of the options described above would require multiple Council meetings, public input, and potentially a NEPA process to implement. Should the Council wish to pursue any of these options, the next step would be to initiate an analysis. The options presented in this discussion paper could be used as alternatives for the analysis.

As presented here, none of the options would require the Council to change any of its current management measures for the Aleutian Islands. The options merely present different ways that the Council might consider focusing attention on the Aleutian Islands, either through a desire to move forward with an ecosystem approach to fisheries, or through a recognition that the unique characteristics of the Aleutian Islands merit consideration separate from the issues of the eastern Bering Sea.

Table 1 Current management measures in BSAI groundfish fisheries that apply across the management area, and those that are AI subarea-specific

Issue	FMP measures that apply BSAI-wide	FMP measures that apply to the AI only
Allocation	AI TAC + BS TAC ≤ 2 MMT AI Fisheries with BSAI TAC: • Directed: Pacific cod • Incidental: Northern, shortaker and rougheye rockfish, flatfish, squid, other species	AI Fisheries with AI subarea TAC: • Directed: Pollock (as of 2005), Pacific ocean perch (by district), Atka mackerel (by district, jig 1% in Eastern AI/BS district), sablefish (trawl 25%, fixed gear 75%), Greenland turbot • Incidental: 'other rockfish'
Permit	BSAI license • certain vessels exempted: vessels fishing only in State waters, vessels less than 32' LOA, or jig gear vessels less than 60' LOA with specific effort restrictions.	Must have AI subarea endorsement
Closures/gear restrictions	Steller sea lions: • 3 nm no-transit zones around rookeries, no trawling for pollock, Pacific cod, or Atka mackerel within 20 nm of rookeries and haulouts during some or all seasons Prohibited species • Attainment of PSC limits for crab, salmon, and herring closes areas Gear: • Non-pelagic trawl gear prohibited in directed pollock fishery	Steller sea lions • Many of the rookeries and haulouts in the AI EFH and HAPC: • Council has designated various AI EFH and HAPC areas with protections such as no bottom-trawling Prohibited species: • One closure area in the AI: Chinook Salmon Savings Area 1.
Prohibited species and bycatch	Halibut, herring, salmon, king crab, and tanner crab are prohibited species. • BSAI-wide halibut PSC limit for trawl fisheries (3,675 mt)	• PSC limit for Chinook salmon in AI pollock trawl fisheries
Share-based programs	• Fixed-gear sablefish fishery is IFQ program. • some CDQ allocations BSAI-wide	• Directed pollock fishery in the AI subarea is fully allocated to the Aleut Corporation. • AI subarea-specific CDQ fisheries for pollock (as of 2005), POP, Atka mackerel, sablefish, Greenland turbot, rockfish;
Monitoring and Reporting	• 100%/30%/0% on vessels >125'/60-124'/<60' LOA • Fish tickets, C/P and processor reports	• 200% observer coverage on AFA vessels harvesting AI pollock

Figure 1 Three options for area-specific management in the Aleutian Islands



Appendix A What is an EAF, and how could the Council do it?

An ecosystem approach to fisheries (EAF) considers interactions among physical, biological, and human components of the ecosystem, while ensuring the overall health of each component, including the sustainability of managed species. The concept has gradually evolved from an understanding that single-species management, that is, managing individually for the sustainability of target species without explicit consideration of the interactions of predators and prey or the interactions of fisheries with other species, is not holistic. Research has shown that fishing can have considerable impacts on the marine environment by altering benthic habitat, food webs, and the diversity of living organisms. Table 2 is a schematic comparison of traditional fishery management and an ecosystem approach to fisheries.

Table 2 Schematic comparison of fisheries and ecosystem management[1].

Criteria		Fisheries management	Ecosystem management
Paradigm		Sector-based. Vertically integrated. Focusing on target resource and people.	Area-based. Holistic. Loosely cross-sectoral. Focusing on habitats and ecosystem integrity.
Governance	**Objectives**	Not always coherent or transparent. "Optimal" system output. Social peace.	A desired state of the ecosystem (health, integrity).
	Scientific input	Formalized (particularly in regional commissions). Variable impact.	Less formalized. Less operational. Often insufficient. Stronger role of advocacy science.
	Decision-making	Most often top-down. Strongly influenced by industry lobbying. Growing role of environmental NGOs.	Highly variable. Often more participative. Strongly influenced by environmental lobbies. Stronger use of tribunals.
	Role of the media	Historically limited. Growing as fisheries crisis spreads.	Stronger use of the media.
	Regional and global institutions	Central role of the Food and Agriculture Organization of the UN and regional fishery bodies.	Central role of United Nations Environment Programme (UNEP) and the Regional Seas Conventions.
Geographical basis		A process of overlapping and cascading subdivision of the oceans for allocation of resources and responsibilities.	A progressive consideration of larger-scale ecosystems for more comprehensive management, e.g. from specific areas to entire coastal zones and Large Marine Ecosystems (LME).
Stakeholder and political base		Narrow. Essentially fishery stakeholders. Progressively opening to other interests.	Much broader. Society-wide. Often with support from recreational and small-scale fisheries.
Global instruments		1982 Law of the Sea Convention, UN Fish Stock Agreement and FAO Code of Conduct.	Ramsar Convention, UN Conference on Environment and Development and 1992 Agenda 21, Convention on Biological Diversity and Jakarta Mandate.
Measures		Regulation of human activity inputs (gear, effort, capacity) or output (removals, quotas) and trade.	Protection of specified areas and habitats, including limitation or exclusion of extractive human activities. Total or partial ban of some human activities.

Specifically, an ecosystem approach to fishery management would take into account such factors as[2]:

- environment and climate regimes,
- habitat that may be affected by fishing,
- non-fishing impacts on living marine resources, particularly fishery target species,
- bycatch management,
- endangered or threatened species or depleted marine mammal stocks,

[1] From Garcia, S.M, Zerbi, A., Aliaume, C., Do Chi, T., Lasserre, G. 2003. The ecosystem approach to fisheries. Issues, terminology, principles, institutional foundations, implementation and outlook. FAO Fisheries Technical Paper. No. 443. Rome, FAO. 2003. p.4.

[2] Adapted from a presentation by Dr. Michael Sissenwine at the January 2005 Conference on Marine Science in the North Pacific, Anchorage.

- uncertainty and risk in fishery management decisions, and
- scientific needs.

The above are recommended elements of an Ecosystem Approach to Fisheries. These elements are already acknowledged and considered as part of the Council's approach to management of the fishery resources under its authority. Given that, why should the Council want to move any further along the path to incorporating an ecosystem approach? One answer might be that the process will allow the Council to better integrate environmental variables in fishery management decisions to improve fishery yield and sustainability. Another answer might be that the Council will be able to more deliberately consider ecosystem processes and the effects of fishery removals on ecosystem productivity and sustainability. Or there may be other answers or variations on these concepts.

Ways for the Council to move forward with an EAF

One way for the Council to move forward with incorporating an ecosystem approach to fisheries is to pursue an ecosystem-based fishery planning approach for the Aleutian Islands, as described in the discussion paper. This would allow the Council to test the development of an explicit EAF management strategy. Changing the management focus from individual consideration of, for example, management of groundfish in the Aleutian Islands, to considering the specific ecosystem area as a whole, would be a next step in applying an EAF.

A Fishery Ecosystem Plan is not the only way the Council could move forward with EAF, however. The Council could establish some new protocols for conducting EAF as part of the Council process. These might include:

- Holding an annual special "ecosystem" meeting during which the Council hears presentations and updates on the status of the currently-measured components of the ecosystem including ocean temperatures and currents, plankton abundance, other productivity measures, oceanographic anomalies (e.g. coccolithophore blooms, phenology of sea ice advance/retreat), forage fish abundance and distribution, target fish species population ecology, and marine mammal and seabird status. This meeting could be held as a sixth meeting added to the current cycle; or it could be convened immediately prior to a regularly-scheduled Council meeting, and thus lengthen it, potentially appreciably. The intent of this meeting would be to place a prominent focus on ecosystem issues during the Council's annual meeting cycle.
- Another option would be to hold an ecosystem briefing, perhaps a day or so in length, just prior to the beginning of the specifications process. This would place new ecosystem information before the Council as it begins consideration of TACs, bycatch allowances, PSC caps, etc. A special ecosystem briefing could more purposely place ecosystem values into the mindset of the specifications process. Some might consider a shorter briefing of this nature as giving short shrift to ecosystem values.
- Council and NOAA Fisheries staffs might develop an ecosystems briefing book that would accompany the above meetings. This would serve as a reference document the Council uses as fishery quotas or other management decisions are made through the course of the coming year.
- The Plan Teams might prepare an expanded ecosystems considerations chapter in the SAFE; this document would be more of a synthesis of information and would describe known fishery interactions with the various components of the marine environment, outline uncertainty in our knowledge, and list the planned research efforts that will be conducted in the coming year(s) to improve our knowledge of these interactions and relationships.

- And regardless the approach taken, the Council would likely need to develop a process to facilitate additional stakeholder participation in fishery management decisions. The Council also may need to dedicate staff to their ecosystem management efforts.

The purpose in implementing one or more of the above options would be to place before the Council new information on ecosystem functions, and afford the Council a glimpse at the "status of the ocean" so that fishery management decisions might be made with more of a conscious and deliberate inclusion of ecosystem values and elements in that process. The Council also would be provided an expression of uncertainty in our current understanding of ecosystem functions and relationships to fish production, with the end result the Council perhaps being more conservative in making management decisions as uncertainty increases.

It should be noted that humans already possess a great deal of knowledge of the marine systems in the North Pacific, and perhaps one of the Council's objectives in pursuing ecosystem-based fishery management would be the full consideration of this knowledge. At the least, the Council should seek to use what we know about these marine ecosystems, and continually update our knowledge and apply it to fishery management decisions. The key will be to develop a process that can effectively apply this enormous information base to management decisions.

The source of the information used for fishery management should also be consciously considered by the Council. As mentioned above, there exists a large body of data and information products available with which to help make management decisions. One of the findings of the *Managing Our Nation's Fisheries II* national conference was a recognition that the data we have available is not always fully utilized, and should be. Annual scientific surveys, stock assessments, and special environmental studies all contribute, annually or more or less frequently, to the information base used by the Council. Local and traditional knowledge, including ecological knowledge passed through generations of Native inhabitants, should also be included in the process. In using all the information that will be available, the Council might consider in its planning process these various sources of information and the means by which this information would be applied to decision making.

An important perspective on ecosystem-based fishery management is that the ecosystems of the North Pacific are now in a state that reflects current utilization of marine resources. Millions of metric tons of shellfish and groundfish are harvested from these seas annually. Ecological theory often includes definitions of components, relationships, and synergisms in an ecosystem from a pristine perspective. But few marine areas on the planet are now in such pristine state. Many consider the North Pacific is a well balanced and healthy marine system; it is also a productive ecosystem, from which biomass, and therefore energy, is removed annually. The process of ecosystem-based management should recognize this as part of the baseline, and an EAF likely should evaluate potential future increases or reductions in fish removals in this context. Fisheries must still be considered stressors of the North Pacific's marine environment, but the human presence is part of the ecosystem as it now functions and ecosystem management should be considered in this context.

Appendix B Excerpt from *Ecosystem-based Fishery Management: A Report to Congress by the Ecosystems Principles Advisory Panel*, April 1999

Principles

- The ability to predict ecosystem behavior is limited.
- Ecosystems have real thresholds and limits which, when exceeded, can effect major system restructuring.
- Once thresholds and limits have been exceeded, changes can be irreversible.
- Diversity is important to ecosystem functioning.
- Multiple scales interact within and among ecosystems.
- Components of ecosystems are linked.
- Ecosystem boundaries are open.
- Ecosystems change with time.

Goals

- Maintain ecosystem health and sustainability.

Policies

- Change the burden of proof.
- Apply the precautionary approach.
- Purchase "insurance" against unforeseen, adverse ecosystem impacts.
- Learn from management experiences.
- Make local incentives compatible with global goals.
- Promote participation, fairness, and equity in policy and management.

Recommendations

Develop a Fisheries Ecosystem Plan

1. Delineate the geographic extent of the ecosystem(s) that occur(s) within Council authority, including characterization of the biological, chemical, and physical dynamics of those ecosystems, and "zone" the area for alternative uses.
2. Develop a conceptual model of the food web.
3. Describe the habitat needs of different life history stages for all plants and animals that represent the "significant food web" and how they are considered in conservation and management measures.
4. Calculate total removals – including incidental mortality – and show how they relate to standing biomass, production, optimum yields, natural mortality, and tropic structure.
5. Assess how uncertainty is characterized and what kind of buffers against uncertainty are included in conservation and management measures.
6. Develop indices of ecosystem health as targets for management.
7. Describe available long-term monitoring data and how they are used.
8. Assess the ecological, human, and institutional elements of the ecosystem which most significantly affect fisheries, and are outside Council/Department of Commerce (DOC) authority.

Included should be a strategy to address those influences in order to achieve both FMP and FEP objectives.

Measures to Implement FEPs

1. Encourage the Councils to apply ecosystem Principles, Goals, and Policies to ongoing activities.
2. Provide training to Council members and staff.
3. Prepare guidelines for FEPs.
4. Develop demonstration FEPs.
5. Provide oversight to ensure development of and compliance with FEPs.
6. Enact legislation requiring FEPs.

Research Required to Support Management

1. Determine the ecosystem effects of fishing.
2. Monitor trends and dynamics in marine ecosystems (ECOWATCH).
3. Explore ecosystem-based approaches to governance.

Appendix C How does EAF fit with EAM?

On a parallel track, the Council is considering a recommendation by the Council's Ecosystem Committee to explore an Ecosystem Approach to Management (EAM) in the Aleutian Islands. If the Council supports the Committee's recommendation, and also supports initiating an analysis of area-specific management in the Aleutian Islands (part of implementing an Ecosystem Approach to Fisheries, or EAF), how are the two initiatives related?

Broadly stated, an EAM would require consideration of all human activities and ecological processes within an ecosystem and a comparative assessment of the possible effects on all of these components from actions taken in that ecosystem. The Ecosystem Committee's recommendation is that the Council consider co-hosting a workshop to explore the possibility of setting up an ecosystem council for the Aleutian Islands ecosystem area, as part of an EAM. If implemented, the ecosystem council would provide a process for communications and exchange of information among the various stakeholders in the Aleutian Islands area and a conscious consideration of proposed or ongoing actions (taken by any stakeholder), and how those actions affect other stakeholders and the physical and biological elements and relationships in that ecosystem (Figure 2). Fishery management would be but one of these possible stakeholder interests. Others could include military and homeland security actions, national wildlife refuge research and monitoring activities, cargo (particularly potentially hazardous materials) shipping (by air or on water), ESA-listed species research and management, human community activities and development (population expansion, port development), and minerals exploration and development.

Thus, fishery management is just one among many of the influences on the ecosystem, in this case the Aleutian Islands ecosystem. The purpose of pursuing an EAM would be for managers, experts, or stakeholders of the various activities in the ecosystem to share knowledge and communicate, and hopefully by doing so to minimize their cumulative adverse impacts on the ecosystem. In short, EAM would provide a mechanism for seeing what your neighbor is doing and how it might impact you, and in turn for your neighbor to see what you are doing and appreciate how or to what extent his/her activities might affect them, all in the context of maintaining a sustainable and productive ecosystem.

Within fisheries, however, managers are also endeavoring to consider ecosystem interactions in management activities. This is captured in the Ecosystem Approach to Fisheries concepts. Theoretically, other stakeholder activities would also be conducted under ecosystem-based management principles (e.g., ecosystem approach to oil drilling). But essentially, in an EAF, fishery managers are trying to account for the ecosystem (in terms of considering predator-prey interactions, habitat impacts, etc.) in fishery management decisions, to the best of their ability and based on available knowledge. An EAF considers interactions with other ecosystem influences, but it focuses on fishery impacts (Figure 3). For example, NEPA requires a cumulative effects analysis for most proposed fishery actions. The cumulative effects on a resource include both fishery and non-fishery impacts, but the objective is to determine the incremental effect of the proposed fishery action on the resource, within the context of other influences. This differs from an EAM approach, which is looking more broadly at the state of the ecosystem, the relative role of all activities, and a mechanism to coordinate those activities to achieve an overall goal of ecosystem sustainability and productivity.

As a result, developing a Fishery Ecosystem Plan for the Aleutian Islands, for example, would have some overlap with an EAM approach such as creating an ecosystem council (Figure 4). Both initiatives are drawing on similar information to describe the state of the Aleutian Islands ecosystem. However the information will be used in different ways, for different objectives. The FEP would help the Council to manage fisheries with a consciousness of the relationship of fishery resources to other components of the ecosystem. An ecosystem council would allow the Council to dialogue with other agencies, for both parties to understand the impacts of their actions on the other, and through the dialogue to mitigate actions where appropriate.

Figure 2 Example of an Ecosystem Approach to Management, and an Ecosystem Council

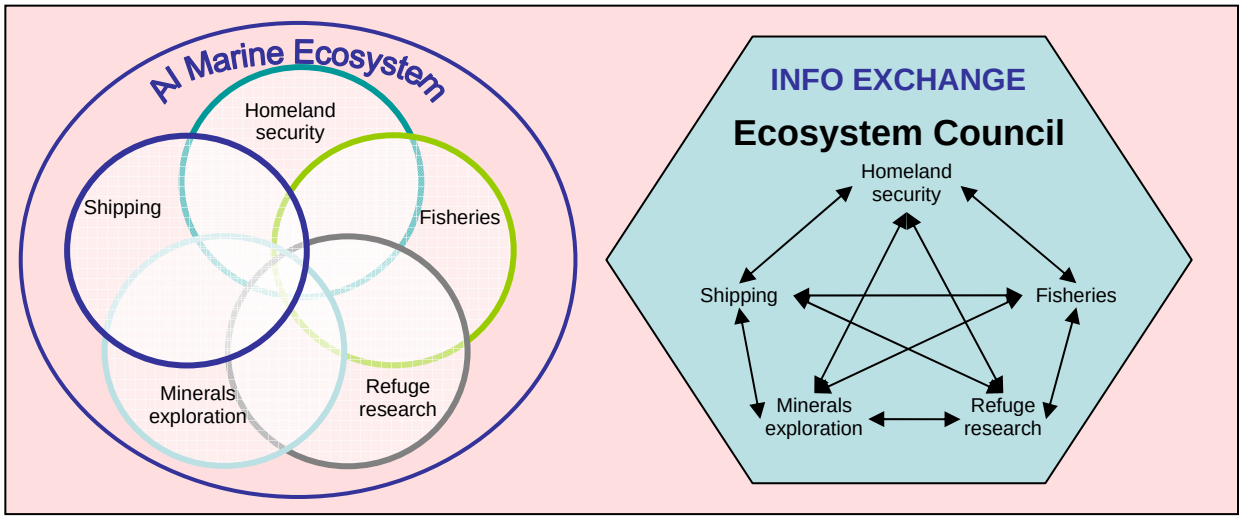


Figure 3 Example of an Ecosystem Approach to Fisheries, and a Fishery Ecosystem Plan

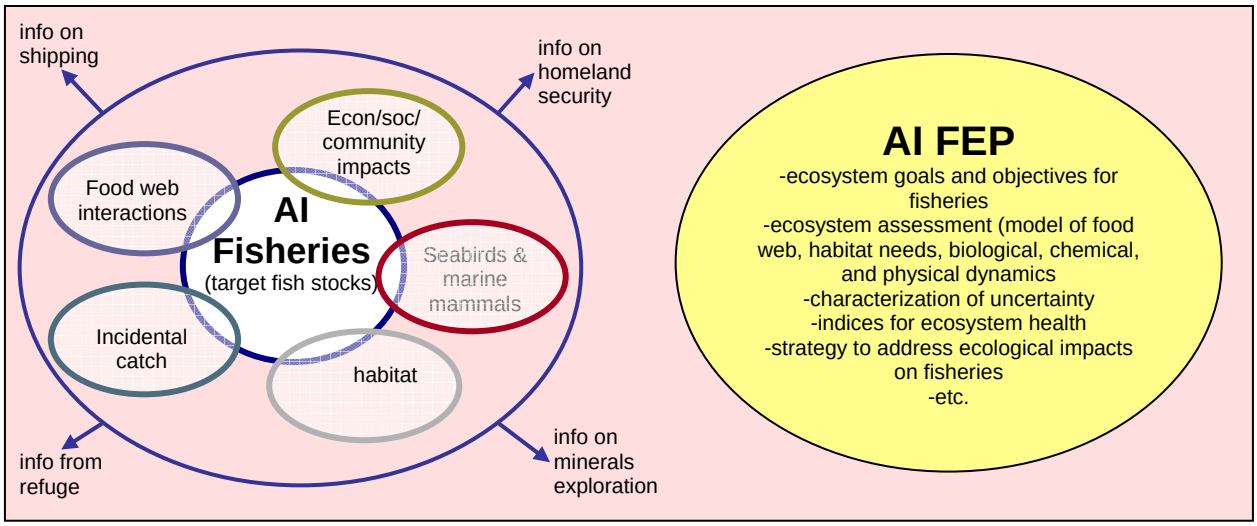


Figure 4 Interaction between the EAM and EAF Aleutian Islands initiatives